

CEGS-05055
(November 1988)

w/Not. #4
(April 1993)

Superseding
CEGS-05060
(July 1984)
typed 3 May 94

SECTION 05055 - WELDING, STRUCTURAL

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC S335 (1989) Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z49.1 (1988) Safety in Welding and Cutting

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ASNT-01 (1988) Recommended Practice SNT-TC-1A

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4 (1986) Symbols for Welding, Brazing and Nondestructive Examination

AWS A3.0 (1989) Standard Welding Terms and Definitions

AWS D1.1 (1992) Structural Welding Code - Steel

1.2 DEFINITIONS

Definitions of welding terms shall be in accordance with AWS A3.0.

1.3 GENERAL REQUIREMENTS

The design of welded connections shall conform to AISC S335 unless otherwise indicated or specified. Material with welds will not be accepted unless the welding is specified or indicated on the drawings or otherwise approved. Welding shall be as specified in this section, except where additional requirements are shown on the drawings or are specified in other sections. Welding shall not be started until welding procedures, welders, welding operators, and tackers have been qualified and the submittals furnished to the Contracting Officer. Qualification testing shall be performed at or near the work site. Each Contractor performing welding shall maintain records of the test results obtained in welding procedure, welder, welding operator, and tacker performance qualifications.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-08 Statements\

Welding Procedure Qualifications\; *FIO*\.

Welder, Welding Operator, and Tacker Qualification\;
FIO\.

Inspector Qualification\; *FIO*\.

Copies of the welding procedure specifications; the procedure qualification test records; and the welder, welding operator, or tacker qualification test records.

SD-18 Records\

Quality Control\; *FIO*\.

A quality assurance plan and records of tests and inspections.

1.5 WELDING PROCEDURE QUALIFICATIONS

Except for prequalified (per AWS D1.1) and previously qualified procedures, each Contractor performing welding shall record in detail and shall qualify the welding procedure specification for any welding procedure followed in the fabrication of weldments. Qualification of welding procedures shall conform to AWS D1.1 and to the specifications in this section. Copies of the welding procedure specification and the results of the procedure qualification test for each type of welding which requires procedure qualification shall be submitted. Approval of any procedure, however, will not relieve the Contractor of the sole responsibility for producing a finished structure meeting all the requirements of these specifications. This information shall be submitted on the forms in Appendix E of AWS D1.1. Welding procedure specifications shall be individually identified and shall be referenced on the detail drawings and erection drawings, or shall be suitably keyed to the contract drawings. In case of conflict between this specification and AWS D1.1, this specification governs.

1.5.1 Previous Qualifications

Welding procedures previously qualified by test may be accepted for this contract without requalification if the following conditions are met:

- a. Testing was performed by an approved testing laboratory, technical consultant, or the Contractor's approved quality control organization.
- b. The qualified welding procedure conforms to the requirements of this specification and is applicable to welding conditions encountered under this contract.
- c. The welder, welding operator, and tacker qualification tests conform to the requirements of this specification and are applicable to welding conditions encountered under this contract.

1.5.2 Prequalified Procedures

Welding procedures which are considered prequalified as specified in AWS D1.1 will be accepted without further qualification. The Contractor shall submit a listing or an annotated drawing to indicate the joints not prequalified. Procedure qualification shall be required for these joints.

1.5.3 Retests

If welding procedure fails to meet the requirements of AWS D1.1, the procedure specification shall be revised and requalified, or at the Contractor's option, welding procedure may be retested in accordance with AWS D1.1. If the welding procedure is qualified through retesting, all test results, including those of test welds that failed to meet the requirements, shall be submitted with the welding procedure.

1.6 WELDER, WELDING OPERATOR, AND TACKER QUALIFICATION

Each welder, welding operator, and tacker assigned to work on this contract shall be qualified in accordance with the applicable requirements of AWS D1.1 and as specified in this section. Welders, welding operators, and tackers who make acceptable procedure qualification test welds will be considered qualified for the welding procedure used.

1.6.1 Previous Qualifications

At the discretion of the Contracting Officer, welders, welding operators, and tackers qualified by test within the previous 6 months may be accepted for this contract without requalification if all the following conditions are met:

- a. Copies of the welding procedure specifications, the procedure qualification test records, and the welder, welding operator, and tacker qualification test records are submitted in accordance with the specified requirements for detail drawings.

- b. Testing was performed by an approved testing laboratory, technical consultant, or the Contractor's approved quality control organization.

- c. The previously qualified welding procedure conforms to the requirements of this specification and is applicable to welding conditions encountered under this contract.

- d. The welder, welding operator, and tacker qualification tests conform to the requirements of this specification and are applicable to welding conditions encountered under this contract.

1.6.2 Certificates

Before assigning any welder, welding operator, or tacker to work under this contract, the Contractor shall submit the names of the welders, welding operators, and tackers to be

employed, and certification that each individual is qualified as specified. The certification shall state the type of welding and positions for which the welder, welding operator, or tacker is qualified, the code and procedure under which the individual is qualified, the date qualified, and the name of the firm and person certifying the qualification tests. The certification shall be kept on file, and 3 copies shall be furnished. The certification shall be kept current for the duration of the contract.

1.6.3 Renewal of Qualification

Requalification of a welder or welding operator shall be required under any of the following conditions:

a. It has been more than 6 months since the welder or welding operator has used the specific welding process for which he is qualified.

b. There is specific reason to question the welder or welding operator's ability to make welds that meet the requirements of these specifications.

c. The welder or welding operator was qualified by an employer other than those firms performing work under this contract, and a qualification test has not been taken within the past 12 months. Records showing periods of employment, name of employer where welder, or welding operator, was last employed, and the process for which qualified shall be submitted as evidence of conformance.

d. A tacker who passes the qualification test shall be considered eligible to perform tack welding indefinitely in the positions and with the processes for which he is qualified, unless there is some specific reason to question the tacker's ability. In such a case, the tacker shall be required to pass the prescribed tack welding test.

1.7 INSPECTOR QUALIFICATION

Inspection and nondestructive testing personnel shall be qualified in accordance with the requirements of ASNT-01 for Levels I or II in the applicable nondestructive testing method. The inspector may be supported by assistant welding inspectors who are not qualified to ASNT-01, and assistant inspectors may perform specific inspection functions under the supervision of the qualified inspector.

1.8 SYMBOLS

Symbols shall be in accordance with AWS A2.4, unless otherwise indicated.

1.9 SAFETY

Safety precautions during welding shall conform to ANSI Z49.1.

PART 2 - PRODUCTS

2.1 WELDING EQUIPMENT AND MATERIALS

All welding equipment, electrodes, welding wire, and fluxes shall be capable of producing satisfactory welds when used by a qualified welder or welding operator performing qualified welding procedures. All welding equipment and materials shall comply with the applicable requirements of AWS D1.1.

PART 3 - EXECUTION

3.1 WELDING OPERATIONS

3.1.1 Requirements

Workmanship and techniques for welded construction shall conform to the requirements of AWS D1.1 and AISC S335. When AWS D1.1 and the AISC S335 specification conflict, the requirements of AWS D1.1 shall govern.

3.1.2 Identification

Welds shall be identified in one of the following ways:

a. Written records shall be submitted to indicate the location of welds made by each welder, welding operator, or tacker.

b. Each welder, welding operator, or tacker shall be assigned a number, letter, or symbol to identify welds made by that individual. The Contracting Officer may require welders, welding operators, and tackers to apply their symbol next to the weld by means of rubber stamp, felt-tipped marker with waterproof ink, or other methods that do not cause an indentation in the metal. For seam welds, the identification mark shall be adjacent to the weld at 3-foot intervals. Identification with die stamps or electric etchers shall not be allowed.

3.2 QUALITY CONTROL

Testing shall be done by an approved inspection or testing laboratory or technical consultant, or if approved, the Contractor's inspection and testing personnel may be used instead of the commercial inspection or testing laboratory or technical consultant. The Contractor shall perform visual inspection to determine conformance with paragraph STANDARDS OF ACCEPTANCE. Procedures and techniques for inspection shall be in accordance with applicable requirements of AWS D1.1.

3.3 STANDARDS OF ACCEPTANCE

Dimensional tolerances for welded construction, details of welds, and quality of welds shall be in accordance with the applicable requirements of AWS D1.1 and the contract drawings. Nondestructive testing shall be by visual inspection methods. The minimum extent of nondestructive testing shall be random 10 percent of welds or joints, as indicated on the drawings.

3.3.1 Nondestructive Examination

The welding shall be subject to inspection and tests in the mill, shop, and field. Inspection and tests in the mill or shop will not relieve the Contractor of the responsibility to furnish weldments of satisfactory quality. When materials or workmanship do not conform to the specification requirements, the Government reserves the right to reject material or workmanship or both at any time before final acceptance of the structure containing the weldment.

3.4 GOVERNMENT INSPECTION AND TESTING

In addition to the inspection and tests performed by the Contractor for quality control, the Government will perform inspection and testing for acceptance to the extent determined by the Contracting Officer. The costs of such inspection and testing will be borne by the Contractor if

unsatisfactory welds are discovered, or by the Government if the welds are satisfactory. The work may be performed by the Government's own forces or under a separate contract for inspection and testing. The Government reserves the right to perform supplemental nondestructive and destructive tests to determine compliance with paragraph STANDARDS OF ACCEPTANCE.

3.5 CORRECTIONS AND REPAIRS

When inspection or testing indicates defects in the weld joints, the welds shall be repaired using a qualified welder or welding operator as applicable. Corrections shall be in accordance with the requirements of AWS D1.1 and the specifications. Defects shall be repaired in accordance with the approved procedures. Defects discovered between passes shall be repaired before additional weld material is deposited. Wherever a defect is removed and repair by welding is not required, the affected area shall be blended into the surrounding surface to eliminate sharp notches, crevices, or corners. After a defect is thought to have been removed, and before rewelding, the area shall be examined by suitable methods to insure that the defect has been eliminated. Repair welds shall meet the inspection requirements for the original welds. Any indication of a defect shall be regarded as a defect, unless reevaluation by nondestructive methods or by surface conditioning shows that no unacceptable defect is present.

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SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC-02	AISC Manual of Steel Construction - Allowable Stress Design, ninth edition
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AISC S303	(1992) Code of Standard Practice for Steel Buildings and Bridges
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AISC S329	(1986) Allowable Stress Design Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts
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AISC S335	(1989) Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 6	(1993b) General Requirements for Rolled Steel Plates, Shapes, Sheet
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Piling, and Bars for
Structural Use

ASTM A 36	(1993a) Structural Steel
ASTM A 53	(1993) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A 242	(1993) High-Strength Low-Alloy Structural Steel
ASTM A 307	(1993a) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A 325	(1993) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A 500	(1993) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 501	(1993) Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
ASTM A 529	(1993) High-Strength Carbon-Manganese Steel of Structural Quality
ASTM A 563	(1993) Carbon and Alloy Steel Nuts
ASTM A 572	(1993) High-Strength Low-Alloy Columbium-Vanadium Steels of Structural Quality
ASTM A 588	(1993) High-Strength Low-Alloy Structural Steel with 50 ksi (345 MPa) Minimum Yield Point to 4 in. (100 mm) Thick
ASTM A 618	(1993) Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing
ASTM F 436	(1993) Hardened Steel Washers

ASTM F 844	(1990) Washers, Steel, Plain (Flat), Unhardened for General Use
ASTM F 959	(1993) Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners
AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)	
ASME B18.21.1	(1990) Lock Washers (Inch Series)
ASME B46.1	(1985) Surface Texture (Surface Roughness, Waviness and Lay)
AMERICAN WELDING SOCIETY (AWS)	
AWS A2.4	(1993) Symbols for Welding, Brazing and Nondestructive Examination
AWS D1.1	(1994) Structural Welding Code - Steel

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC Paint 25 (1991) Red Iron Oxide, Zinc Oxide,
Raw Linseed Oil and Alkyd Primer
(without Lead and Chromate
Pigments)

1.2 GENERAL REQUIREMENTS

Structural steel fabrication and erection shall be performed by an organization experienced in structural steel work of equivalent magnitude. The Contractor shall be responsible for correctness of detailing, fabrication, and for the correct fitting of structural members. Connections, for any part of the structure not shown on the contract drawings, shall be considered simple shear connections and shall be designed and detailed in accordance with pertinent provisions of AISC-02. Substitution of sections or modification of connection details will not be accepted unless approved by the Contracting Officer. AISC S335 with pertinent provisions of AISC-02 shall govern the work. Welding shall be in accordance with AWS D1.1. High-strength bolting shall be in accordance with AISC S329 .

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-04 Drawings\

Structural Steel System\; *FIO*\.

Structural Connections\; *GA*\.

Shop and erection details including members (with their connections) not shown on the contract drawings. Welds shall be indicated by standard welding symbols in accordance with AWS A2.4.

SD-08 Statements\

Erection\; *FIO*\.

Erection plan of the structural steel framing required. Erection plan shall conform to the requirements of AISC S303, shall be submitted prior to erection, and shall describe all necessary temporary supports, including the sequence of installation and removal.

SD-13 Certificates\

Mill Test Reports\; *FIO*\.

Certified copies of mill test reports for structural steel, structural bolts, nuts, washers and other related structural steel items.

Welder Qualifications\; *FIO*\.

Certified copies of welder qualifications test records showing qualification in accordance with AWS D1.1.

Fabrication\; *FIO*\.

A copy of the AISC certificate indicating that the fabrication plant meets the specified structural steelwork category.

SD-14 Samples\

High Strength Bolts\; *FIO*\.

Carbon Steel Bolts\; *FIO*\.

Carbon Steel Nuts\; *FIO*\.

Washers\; *FIO*\.

Random samples of bolts, nuts, and washers as delivered to the job site if requested, taken in the presence of the Contracting Officer and provided to the Contracting Officer for testing to establish compliance with specified requirements.

1.4 STORAGE

Material shall be stored out of contact with the ground in such manner and location as will minimize deterioration.

PART 2 - PRODUCTS

2.1 STRUCTURAL STEEL

2.1.1 Carbon Grade Steel

Carbon grade steel shall conform to [ASTM A 36].

2.1.2 High-Strength Low-Alloy Steel

High-strength low-alloy steel shall conform to ASTM A 572, Grade 50.

2.2 STRUCTURAL TUBING

Structural tubing shall conform to ASTM A 500, Grade B.

2.3 STEEL PIPE

Steel pipe shall conform to ASTM A 53, Type E or Type S, Grade B.

2.4 HIGH STRENGTH BOLTS

High strength bolts shall conform to ASTM A 325.

2.5 CARBON STEEL BOLTS

Carbon steel bolts shall conform to ASTM A 307, Grade A.

2.6 CARBON STEEL NUTS

Carbon steel nuts shall conform to ASTM A 563, Grade A, Hex Style.

2.7 WASHERS

Plain washers shall conform to ASTM F 844. Other types, when required, shall conform to ASTM F 959.

2.8 PAINT

Paint shall conform to SSPC Paint 25.

PART 3 - EXECUTION

3.1 FABRICATION

Fabrication shall be in accordance with the applicable provisions of the AISC S335. Fabrication and assembly shall be done in the shop to the greatest extent possible. The fabricating plant shall be certified under the AISC quality certification program for Category I structural steelwork. Compression joints depending on contact bearing shall have a surface roughness not in excess of 500 micro inches as determined by ASME B46.1, and ends shall be square within the tolerances for milled ends specified in ASTM A 6. Structural steelwork, except surfaces of steel to be encased in concrete, surfaces to be field welded, surfaces to be fireproofed, and contact surfaces of friction-type high-strength bolted connections shall be prepared for painting in accordance with the AISC S335 and primed with the specified paint.

3.2 ERECTION

Erection of structural steel shall be in accordance with the applicable provisions of the AISC S335.

3.2.1 Connections

Anchor bolts and other connections between the structural steel and foundations shall be provided and shall be properly located and built into connecting work.

3.2.2 Base Plates and Bearing Plates

Column base plates for columns and bearing plates for beams, girders, and similar members shall be provided. Base plates and bearing plates shall be provided with full bearing after the supported members have been plumbed and properly positioned, but prior to placing superimposed loads. Separate setting plates under column base plates will not be permitted. The area under the plate shall be damp-packed solidly with bedding mortar, except where nonshrink grout is indicated on the drawings. Bedding mortar and grout shall be as specified in Section 03300 CONCRETE FOR BUILDING CONSTRUCTION.

3.2.3 Field Welded Connections

Field welded structural connections shall be completed before load is applied.

3.2.4 Field Priming

After erection, the field bolt heads and nuts, field welds, and any abrasions in the shop coat shall be cleaned and primed with paint of the same quality as that used for the shop coat.

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-- End of Section --

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SECTION 05210 - STEEL JOISTS

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

STEEL JOIST INSTITUTE (SJI)

SJI-01 (1992) Standard Specifications Load
Tables and Weight Tables for Steel
Joists and Joist Girders.

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with SECTION: 01300 - SUBMITTAL DESCRIPTIONS:

SD-04, Drawings\

Steel Joists\; *FIO*\.

Detail drawings shall include fabrication and erection details, specifications for shop painting, and identification markings of joists.

SD-13, Certificates\

Steel Joists\; *FIO*\.

Certificates stating that the steel joists have been designed and manufactured in accordance with SJI-01. Complete engineering design computations may be submitted in lieu of the certification.

1.3 DESCRIPTION

Steel joists are designated on the drawings in accordance with the standard designations of the Steel Joist Institute. Joists of other standard designations or joists with properties other than those shown may be substituted for the joists designated provided the structural properties are equal to or greater than those of the joists shown and provided all other specified requirements are met.

1.4 DELIVERY AND STORAGE

Materials shall be delivered to the site in undamaged condition and stored off the ground in a well drained location, protected from damage, and easily accessible for inspection and handling.

PART 2 - PRODUCTS

2.1 OPEN WEB STEEL JOISTS

Open web steel joists shall conform to SJI-01, K-Series. Joists shall be designed to support the loads given in the standard load tables of SJI-01.

2.2 ACCESSORIES AND FITTINGS

Accessories and fittings, including end supports and bridging, shall be in accordance with the standard specifications under which the members were designed.

2.3 SHOP PAINTING

Joists and accessories shall be shop painted with a rust-inhibiting primer paint.

PART 3 - EXECUTION

3.1 ERECTION

Installation of joists shall be in accordance with the standard specification under which the member was produced. Joists shall be handled in a manner to avoid damage. Damaged joists shall be removed from the site, except when field repair is approved and such repairs are satisfactorily made in accordance with the manufacturer's recommendations. Joists shall be accurately set, and end anchorage shall be in accordance with the standard specification under which the joists were produced. Joist bridging and anchoring shall be secured in place prior to the application of any construction

loads. Any temporary loads shall be distributed so that the carrying capacity of any joist is not exceeded. Loads shall not be applied to bridging during construction or in the completed work. Abraded, corroded, and field welded areas shall be cleaned and touched up with the same type of paint used in the shop painting.

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SECTION 05300 - STEEL DECKING

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC S335 (1989) Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI SG-673 (1986; Addenda 1989; Errata Nov 30,1990) Cold-Formed Steel Design Manual

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 108 (1990a) Steel Bars, Carbon, Cold Finished, Standard Quality

ASTM A 446 (1991) Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality

ASTM A 525 (1991b) General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process

ASTM A 570 (1991) Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality

ASTM A 611 (1991) Steel, Sheet, Carbon, Cold-Rolled, Structural Quality

ASTM A 792 (1989) Steel Sheet, Aluminum-Zinc Alloy-Coated by the Hot-Dip Process

ASTM C 423 (1990a) Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

ASTM E 795 (1992) Mounting Test Specimens During Sound Absorption Tests

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 (1992) Structural Welding Code - Steel

AWS D1.3 (1989) Structural Welding Code - Sheet Steel

MILITARY SPECIFICATIONS (MS)

MS DOD-P-21035 (Rev A) Paint, High Zinc Dust Content, Galvanizing Repair (Metric)

STEEL DECK INSTITUTE (SDI)

SDI-02 (1991) Diaphragm Design Manual, second edition

SDI Pub No 28 (1992) Design Manual for Composite Decks, Form Decks, Roof Decks, and Cellular Metal Floor Deck with Electrical Distribution

Federal Specification (FS)

FS TT-P-664

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-01 Data\

Deck Units\; *FIO*\.

Design computations for the structural properties of the deck units or SDI certification that the units are designed in accordance with SDI specifications.

SD-04 Drawings\

Deck Units\; *FIO*\.

Accessories\; *FIO*\.

Attachments\; *FIO*\.

Holes and Openings\; *FIO*\.

Drawings shall include type, configuration, structural properties, location, and necessary details of deck units, accessories, and supporting members; size and location of holes to be cut and reinforcement to be provided; location and sequence of welded or fastener connections; and the manufacturer's erection instructions.

SD-13 Certificates\

Deck Units\; *FIO*\.

Attachments\; *FIO*\.

Manufacturer's certificates attesting that the decking material meets the specified requirements. Manufacturer's certificate attesting that the operators are authorized to use the low-velocity piston tool.

SD-14 Samples\

Deck Units\; *FIO*\.

Accessories\; *FIO*\.

A 2 sq. ft. sample of the decking material to be used, along with a sample of each of the accessories used. A sample of acoustical material to be used shall be included.

SD-18 Statements\

Attachments\; *FIO*\.

Prior to welding operations, copies of qualified procedures and lists of names and identification symbols of qualified welders and welding operators.

1.3 DELIVERY, STORAGE, AND HANDLING

Deck units shall be delivered to the site in a dry and undamaged condition, stored off the ground with one end elevated, and stored under a weathertight covering permitting good air circulation. Finish of deck units shall be maintained at all times by using touch-up paint whenever necessary to prevent the formation of rust.

PART 2 - PRODUCTS

2.1 DECK UNITS

Deck units shall conform to SDI Pub No 28. Panels of maximum possible lengths shall be used to minimize end laps. Fabricate deck units in lengths to span 3 or more supports with flush, telescoped, or nested 2-inch laps at ends, and interlocking, or nested side laps, unless otherwise indicated. Deck with cross-sectional configuration differing from the units indicated may be used, provided that the properties of the proposed units, determined in accordance with AISI SG-673, are equal to or greater than the properties of the units indicated and that the material will fit the space provided without requiring revisions to adjacent materials or systems.

2.1.1 Roof Deck

Steel deck used in conjunction with insulation and built-up roofing shall conform to ASTM A 611 . Roof deck units shall be fabricated of 0.0295 inch design thickness or thicker steel and shall be shop primed with grey or white baked on lead and chromate-free, rust-inhibitive primer, conforming to the performance requirements of FS TT-P-664.

2.1.2 Composite Deck

Deck used as part of a composite deck assembly shall conform to ASTM A 446. Deck used as the tension reinforcing in composite deck shall be fabricated of [the steel design thickness required by the design drawings, and shall be zinc-coated in conformance with ASTM A 525, G60 coating

class. Deck units used in composite deck shall have adequate embossment to develop mechanical shear bond to provide composite action between the deck and the concrete.

2.1.3 Form Deck

Deck used as a permanent form for concrete shall conform to ASTM A 446 . Deck used as a form for concrete shall be fabricated of the steel design thickness required by the design drawings, and shall be zinc-coated in conformance with ASTM A 525, G60 coating class.

2.1.4 Sump Pans

Sump pans shall be provided for roof drains and shall be minimum 0.0747 inch thick steel, recessed type. Sump pans shall be shaped to meet roof slope by the supplier or by a sheet metal specialist. Bearing flanges of sump pans shall overlap steel deck a minimum of 3 inches. Opening in bottom of pan shall be shaped, sized, and reinforced to receive roof drain.

2.1.5 Shear Connectors

Shear connectors shall be headed stud type, ASTM A 108, Grade 1015 or 1020, cold finished carbon steel with dimensions complying with AISC S335.

2.2 TOUCH-UP PAINT

Touch-up paint for shop-painted units shall be of the same type used for the shop painting, and touch-up paint for zinc-coated units shall be an approved galvanizing repair paint with a high-zinc dust content. Welds shall be touched-up with paint conforming to MS DOD-P-21035. Finish of deck units and accessories shall be maintained until construction is complete by using touch-up paint whenever necessary to prevent the formation of rust.

2.3 ADJUSTING PLATES

Adjusting plates or segments of deck units shall be provided in locations too narrow to accommodate full-size units. As far as practical, the plates shall be the same thickness and configuration as the deck units.

2.4 CLOSURE PLATES

2.4.1 Closure Plates for Roof Deck

Voids above interior walls shall be closed with sheet metal where shown. Open deck cells at parapets, end walls, eaves, and openings through roofs shall be closed with sheet metal. Sheet metal shall be same thickness as deck units.

2.4.2 Closure Plates for Composite Deck

The concrete shall be supported and retained at each floor level. Provide edge closures at all edges of the slab of sufficient strength and stiffness to support the wet concrete. Metal closures shall be provided for all openings in composite steel deck 1/4 inch and over, including but not limited to:

2.4.2.1 Cover Plates to Close Panels

Cover plates to close panel edge and end conditions and where panels change direction or abut. Butt joints in composite steel deck may receive a tape joint cover.

2.4.2.2 Column Closures to Close Openings

Column closures to close openings between steel deck and structural steel columns.

2.4.2.3 Sheet Metal

Where deck is cut for passage of pipes, ducts, columns, etc., and deck is to remain exposed, provide a neatly cut sheet metal collar to cover edges of deck. Do not cut deck until after installation of supplemental supports.

2.5 ACCESSORIES

The manufacturer's standard accessories shall be furnished as necessary to complete the deck installation. Metal accessories shall be of the same material as the deck and have minimum design thickness as follows: saddles, 0.0474 inch; welding washers, 0.0598 inch; cant strip, 0.0295 inch; other metal accessories, 0.0358 inch; unless otherwise indicated. Accessories shall include but not be limited to saddles, welding washers, cant strips, butt cover plates, underlapping sleeves, and ridge and valley plates.

PART 3 - EXECUTION

3.1 ERECTION

Erection of deck and accessories shall be in accordance with SDI Pub No 28, SDI-02 and the approved detail drawings. Damaged deck and accessories including material which is permanently stained or contaminated, with burned holes or deformed shall not be installed. The deck units shall be placed on secure supports, properly adjusted, and aligned at right angles to supports before being permanently secured in place. The deck shall not be filled with concrete, used for storage or as a working platform until the units have been secured in position. Shoring shall be in position before concrete placement begins in composite or form deck. Loads shall be distributed by appropriate means to prevent damage during construction and to the completed assembly. The maximum uniform distributed storage load shall not exceed the design live load. There shall be no loads suspended directly from the steel deck.

3.2 SHORING

Shoring requirements for placing and curing of concrete in the composite floor deck assemblies shall be as shown.

3.3 ATTACHMENTS

All fasteners shall be installed in accordance with the manufacturer's recommended procedure, except as otherwise specified. The deck units shall be welded with nominal 5/8 inch diameter puddle welds [or fastened with screws, powder-actuated fasteners or pneumatically driven fasteners to supports as indicated on the design drawings and in accordance with requirements of SDI Pub No 28. All welding of steel deck shall be in accordance with AWS D1.3 using methods and electrodes as recommended by

the manufacturer of the steel deck being used. Welds shall be made only by operators previously qualified by tests prescribed in AWS D1.3 to perform the type of work required. Welding washers shall not be used at the connections of the deck to supports. Welding washers shall not be used at sidelaps. Holes and similar defects will not be acceptable. Deck ends shall be lapped 2 inches . All partial or segments of deck units shall be attached to structural supports in accordance with Section 2.5 of SDI-02. Powder-actuated fasteners shall be driven with a low-velocity piston tool by an operator authorized by the manufacturer of the piston tool. Pneumatically driven fasteners shall be driven with a low-velocity fastening tool and shall comply with the manufacturer's recommendations. Shear connectors shall be attached as shown and shall be welded as per AWS D1.1 .

3.4 HOLES AND OPENINGS

All holes and openings required shall be coordinated with the drawings, specifications, and other trades. Holes and openings shall be drilled or cut, reinforced and framed as indicated on the drawings or described in the specifications and as required for rigidity and load capacity. Holes and openings less than 6 inches across require no reinforcement. Holes and openings 6 to 12 inches across shall be reinforced by 0.0474-inch thick steel sheet at least 12 inches wider and longer than the opening and be fastened to the steel deck at each corner of the sheet and at a maximum of 6 inches on center. Holes and openings larger than 12 inches shall be reinforced by steel angles installed perpendicular to the steel joists and supported by the adjacent steel joists. Steel angles shall be installed perpendicular to the deck ribs and shall be fastened to the angles perpendicular to the steel joists. Openings must not interfere with seismic members such as chords and drag struts.

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SECTION 05410 - COLD-FORMED STEEL STRUCTURAL FRAMING

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI SG-673 (1986; Addenda 1989; Errata Nov 30, 1990) Cold-Formed Steel Design Manual

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 446 (1991) Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality

ASTM A 525 (1991b) General Requirement for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 (1992) Structural Welding Code - Steel
FEDERAL SPECIFICATIONS (FS)
FS FF-B-575 (Rev C) Bolts, Hexagon and Square
FS FF-B-588 (Rev D) Bolt, Toggle: and Expansion Sleeve, Screw
FS FF-S-325 (Basic; Int Am 3; Notice 1) Shield, Expansion; Nail, Expansion; and Nail, Drive Screw (Devicess, Anchoring, Masonry)

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-01 Data\

Calculations\; *GA*\.

Design calculations, as necessary, shall indicate compliance with load-bearing requirements for the following:

- a. Framing.
- b. Studs.
- c. Runners.
- d. Connections for wind bracing straps and where required.

SD-04 Drawings\

Cold-Formed Steel Framing\; *FIO*\.

Detail drawings shall indicate all member gages, spacings, and sizes; shop and field assembly details including cut and fastenings; type and locations of welds, bolts, and fastening devices; and panel fabrication, with individual panel drawings for each condition including configuration,

dimensions, materials, attachments, structural calculations, and panel locations.

SD-06 Instructions\

Cold-Formed Steel Framing\; *FIO*\.

Installation procedures.

1.3 DELIVERY AND STORAGE

Materials shall be delivered to the site in undamaged condition and stored off the ground in a well drained, ventilated, dry location; protected from damage; protected from rain or snow by impervious covering or shelter; properly supported on a level platform; and shall be easily accessible for inspection and handling. Handle materials carefully to prevent damage. Replace damaged items with new.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Steel Studs

Steel studs for exterior wall framing shall be formed from steel sheets conforming to ASTM A 446 except that the steel shall have a minimum yield point of 50,000 psi (Grade D) for 12, 14, and 16 gages and 33,000 (Grade A) for 18 and 20 gages. Studs shall be C-shaped, sized as shown on the drawings, and be hot dipped galvanized. Stud flanges shall be not less than 1-3/8 inches wide, and each flange shall, in addition, have a stiffening lip bent parallel to the stud web. Stiffening lips shall be at least 1/2-inch wide with turned or folded edges. Where required for utility lines and/or wires, stud webs shall have preformed holes or knockouts not larger than 3 square inches spaced not less than 6 inches on centers. Holes or knockouts shall be centered on the longitudinal axis of the web and shall be not more than 1-5/8 inches across the longitudinal axis.

2.1.2 Runner Channels, Bridging, and Accessories

Ceiling and floor runner channels, bridging, and accessories shall be formed from 16 gage standard commercial steel sheets with a minimum yield point of 50,000 psi, and shall be galvanized. Track shall be C-shaped with web dimension to receive stud ends, and with flange dimension not less than 1 1/4-inches.

2.1.3 Bridging

Unless otherwise shown on the drawings, horizontal bridging shall be spaced not greater than 5 feet on center for wind loaded walls and 3'-4" on center for axial loaded walls.

2.1.4 Protective Coating

All studs, floor and ceiling track, bridging, and accessories shall have a G90 galvanized coating meeting the requirements of ASTM A 525.

2.1.5 Fasteners

2.1.5.1 Screws

Screws shall be corrosion-resistant, self-tapping and self-drilling type, with pan head; size as recommended by steel framing manufacturer.

2.1.5.2 Welding

Welding shall be in accordance with AWS D1.1. A wire feeder type welder may be used.

2.2 Design and Fabrication

Cold-formed steel structural framing shall be designed and fabricated to conform to AISI SG-673.

2.2.1 Wind Loading

Steel framing system shall be designed to carry wind loads of 33 psf with the maximum deflection limited to $L/600$.

2.2.2 Web Stiffeners

Web stiffeners shall be provided at concentrated load points and at end reactions whenever the web height/thickness ratio exceeds 200.

2.2.3 Panel Fabrication

Framing components may be prefabricated into panels prior to erection.

2.2.4 Cutting and Placement of Framing Members

Framing Components shall be cut square or on an angle as in bracing to fit square against abutting members. Members shall be held firmly in position until properly fastened.

2.2.5 Attachments

Attachments of similar components shall be done by welding. Dissimilar framing components shall be attached by welding, screw attachment or by bolting. Wire tying of framing components in structural applications will not be permitted. All welds shall be touched up with a zinc-rich paint.

2.2.6 Prefabricated Panels

Prefabricated panels shall be square and braced against racking. Lifting of prefabricated panels shall be done in a manner as to avoid local distortion in any member.

PART 3 - EXECUTION

3.1 ERECTION

3.1.1 Floor Runner Channels

Channels shall be accurately aligned and securely attached in place. Attachment shall be by expansion shields and machine bolts, self-drilling anchors, or other approved methods with shear load capacity of 350 pounds minimum. Space anchors 24 inches on center maximum. Butt welds or splices shall be made at all butt joints in the channel.

3.1.2 Studs

Studs shall be seated squarely in the track with flanges abutting the track web, plumbed and aligned. Fasten studs to the top and bottom runner channels by welding or screwing both flanges to the runner channels. All studs shall be full wall height without splices. Jack studs shall be provided between track and sills, and between door and window headers and top track. Provide double studs at jambs of door and window openings and at control joints. Provide not less than 3 studs at corners. All welds shall be fillet, plug, butt, or seam. Install diagonal stud bracing between door and window headers and the top track. Stud spacing shall be determined from design calculations but not to exceed 24 inches on center.

3.1.3 Ceiling Runner Channels

Channels shall be fitted and attached to studs as specified for the floor runner channel attachment. Ceiling runner channels shall continue across control joints without splices.

3.1.4 Special Framing

Special framing shall be provided at corners, intersections, jambs of openings, and over door and window openings to distribute the structural loads imposed and to provide attachment surfaces for connecting materials.

3.1.5 Temporary Bracing

Temporary bracing shall be provided until erection is completed.

3.1.6 Bridging

Bridging may be either C-shaped stud member cut to fit between stud webs, or continuous 1 1/2-inches cold rolled channel inserted through stud web cut-outs. Attach bridging to each web by welding.

3.1.7 Diagonal Bracing

Provide diagonal bracing where required. Attach by welding to floor and ceiling runner channels and at each stud intersection.

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SECTION 05500 - MISCELLANEOUS METAL

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ALUMINUM ASSOCIATION (AA)

AA DAF-45 (1980) Designation System for
Aluminum Finishes

AA SAA-46 (1978) Standards for Anodized
Architectural Aluminum

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A14.3 (1992) Ladders - Fixed - Safety
Requirements

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36 (1993a) Structural Steel

ASTM A 53 (1993) Pipe, Steel, Black and
Hot-Dipped, Zinc-Coated Welded and
Seamless

ASTM A 123 (1989a) Zinc (Hot-Dip Galvanized)
Coatings on Iron and Steel Products

ASTM A 283 (1993) Low and Intermediate Tensile
Strength Carbon Steel Plates

ASTM A 446 (1993) Steel Sheet, Zinc-Coated
(Galvanized) by the Hot-Dip Process,
Structural (Physical) Quality

ASTM A 475	(1989) Zinc-Coated Steel Wire Strand
ASTM A 500	(1993) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 525	(1993) General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
ASTM B 26	(1992a) Aluminum-Alloy Sand Castings
ASTM B 221	(1992a) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
ASTM B 429	(1992a) Aluminum-Alloy Extruded Structural Pipe and Tube
AMERICAN WELDING SOCIETY (AWS)	
AWS D1.1	(1994) Structural Welding Code - Steel
FEDERAL SPECIFICATIONS (FS)	
FS AA-S-271	(Rev D; Am 1) Shelving, Storage and Display, Steel, Interchangeable, Nut and Bolt Type
FS AA-S-1048	(Basic) Shelving, Storage and Display, Steel, Clip Type
FS RR-C-271	(Rev D) Chains and Attachments, Welded and Weldless
FS RR-G-1602	(Rev C) Grating, Metal, Other Than Bar Type (Floor, Except for Naval Vessels)
NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)	
NAAMM-01	(1988) Metal Finishes Manual for Architectural and Metal Products
1.2	SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-04 Drawings\

Miscellaneous Metal Items\; *FIO*\.

Detail drawings indicating material thickness, type, grade, and class; dimensions; and construction details. Drawings shall include catalog cuts, erection details, manufacturer's descriptive data and installation instructions, and templates. Detail drawings for the following items:

- a. Access doors and frames.
- b. Pipe guards.
- c. Expansion-joint covers
- d. Handrails.
- e. Ladders.
- f. Miscellaneous
- g. Roof scuttles.
- h. Safety nosings.
- i. Steel stairs

1.3 GENERAL REQUIREMENTS

The Contractor shall verify all measurements and shall take all field measurements necessary before fabrication. Welding to or on structural steel shall be in accordance with AWS D1.1. Items specified to be galvanized, when practicable and not indicated otherwise, shall be hot-dip galvanized after fabrication. Galvanizing shall be in accordance with ASTM A 123, ASTM A 446, or ASTM A 525, as applicable. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and shall harmonize with the material to which fastenings are applied. Materials and parts necessary to complete each item, even though such work is not definitely shown or specified, shall be included. Poor matching of holes for fasteners shall be cause for rejection. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall provide strength and stiffness. Joints exposed to the weather shall be formed to exclude water.

1.4 DISSIMILAR MATERIALS

Where dissimilar metals are in contact, the surfaces shall be protected with a coat of bituminous paint or asphalt varnish.

1.5 WORKMANSHIP

Miscellaneous metalwork shall be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Welding shall be continuous along the entire area of contact except where tack welding is permitted. Exposed connections of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish, and unless otherwise approved, exposed riveting shall be flush. Where tight fits are required, joints shall be milled. Corner joints shall be coped or mitered, well formed, and in true alignment. Work shall be accurately set to established lines and elevations and securely fastened in

place. Installation shall be in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

1.6 ANCHORAGE

Anchorage shall be provided where necessary for fastening miscellaneous metal items securely in place. Anchorage not otherwise specified or indicated shall include slotted inserts made to engage with the anchors, expansion shields, and power-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; and lag bolts and screws for wood.

PART 2 - PRODUCTS

2.1 SHOP PAINTING

Surfaces of ferrous metal except galvanized surfaces, shall be cleaned and shop coated with the manufacturer's standard protective coating unless otherwise specified. Surfaces of items to be embedded in concrete shall not be painted. Items to be finish painted shall be prepared according to manufacturer's recommendations or as specified.

2.2 ACCESS DOORS AND PANELS

Doors and panels shall be flush type unless otherwise indicated. Frames for access doors shall be fabricated of not lighter than 16 gauge steel with welded joints and finished with anchorage for securing into construction. Access doors shall be a minimum of 14 by 20 inches and of not lighter than 14 gauge steel, with stiffened edges, complete with attachments. Access doors shall be hinged to frame and provided with a flush face, screw driver operated latch. Exposed metal surfaces shall have a shop applied prime coat.

2.3 PIPE GUARDS

Pipe guards shall be heavy duty steel pipe conforming to ASTM A 53, Type E or S, weight STD, black finish.

2.4 EXPANSION JOINT COVERS

Expansion joint covers shall be constructed of extruded aluminum with anodized satin finish for walls and ceilings and with standard mill finish for floor covers and exterior covers. Plates, backup angles, expansion filler strip and anchors shall be designed as indicated.

2.5 HANDRAILS

Handrails shall be designed to resist a concentrated load of 200 pounds in any direction at any point of the top of the rail or 20 pounds per foot applied horizontally to top of the rail, whichever is more severe.

2.5.1 Steel Handrails, Including Carbon Steel Inserts

Steel handrails, including inserts in concrete, shall be steel pipe conforming to ASTM A 53. Steel railings shall be 1-1/2 inch nominal size. Railings shall be hot-dip galvanized.

a. Fabrication: Joint posts, rail, and corners shall be fabricated by one of the following methods:

(1) Flush type rail fittings of commercial standard, welded and ground smooth with railing splice locks secured with 3/8 inch hexagonal recessed-head setscrews.

(2) Mitered and welded joints by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints, and grinding smooth. Railing splices shall be butted and reinforced by a tight fitting interior sleeve not less than 6 inches long.

(3) Railings may be bent at corners in lieu of jointing, provided bends are made in suitable jigs and the pipe is not crushed.

b. Removable sections, toe-boards, and brackets shall be provided as indicated.

2.5.2 Aluminum Handrails

Handrails shall consist of 1-1/2 inch square aluminum semi-hollow tube with rounded corners per ASTM B 221. Railings shall be aluminum color as indicated on drawings. All fasteners shall be Series 300 stainless steel.

a. Fabrication: Jointing shall be by one of the following methods:

(1) Flush type rail fittings, welded and ground smooth with splice locks secured with 3/8 inch recessed head setscrews.

(2) Mitered and welded joints, made by fitting post to top rail and intermediate rail to post shall be groove welded and ground smooth.

(3) Railings shall be assembled using slip-on aluminum-magnesium alloy fittings for joints. Fittings shall be fastened to tube with 1/4 inch or 3/8 inch stainless steel recessed head setscrews. Assembled railings shall be provided

with fittings only at vertical supports or at rail terminations attached to walls. A setscrew shall be provided in only one side of the slip-on sleeve. Alloy fittings shall conform to ASTM B 26.

b. Brackets shall be provided where indicated, using flange castings as appropriate.

2.6 LADDERS

Ladders shall be aluminum, fixed rail type in accordance with ANSI A14.3.

2.7 MISCELLANEOUS

Miscellaneous plates and shapes for items that do not form a part of the structural steel framework, such as lintels, sill angles, miscellaneous mountings, and frames, shall be provided to complete the work.

2.8 ROOF SCUTTLES

Roof scuttles shall be of galvanized steel not less than 14 gauge, with 3 inch beaded flange welded and ground at corners. Scuttle shall be sized to provide minimum clear opening of 42 by 30 inches. Cover and curb shall be insulated with 1 inch thick rigid insulation covered and protected by galvanized steel liner not less than 26 gauge. The curb shall be equipped with an integral metal cap flashing of the same gauge and metal as the curb, full welded and ground at corners for weathertightness. Scuttle shall be completely assembled with heavy hinges, compression spring operators enclosed in telescopic tubes, positive snap latch with turn handles on inside and outside and neoprene draft seal. Fasteners shall be provided for padlocking on the inside. The cover shall be equipped with an automatic hold-open arm complete with handle to permit one hand release.

2.9 SAFETY NOSING

Safety nosings shall be of cast aluminum with cross-hatched abrasive surface. Nosing shall be 3 inches wide and terminating at not more than 6 inches from the ends of treads, except nosing for metal pan cement-filled treads shall extend the full length of the tread. Safety nosings shall be provided with anchors not less than 3/4 inch long. Integrally cast mushroom anchors are not acceptable.

2.10 LOUVER GUARDS, BAR GRILLE TYPE

Louver guards shall be constructed of 1/2 inch diameter galvanized steel bars, welded vertically and horizontally at six (6) inches on center. Each bar will be welded securely to a 1 by 1/8 inch angle frame. The corners of the frame shall be mitered and welded.

2.11 STEEL STAIRS

Steel stairs shall be complete with structural channel stringers, metal pan cement-filled treads, landings, columns, handrails, and necessary bolts and other fastenings as indicated. Structural steel shall conform to ASTM A 36. Stairs and accessories shall be galvanized. Risers on stairs with metal pan treads shall be deformed to form a sanitary cove to retain the tread concrete. Integral nosings shall have braces extended into the concrete fill.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

All items shall be installed at the locations shown and according to the manufacturer's recommendations. Items listed below require additional procedures as specified.

3.2 REMOVABLE ACCESS PANELS

A removable access panel not less than 12 by 12 inches shall be installed directly below each valve, flow indicator, damper, or air splitter that is located above the ceiling, other than an acoustical ceiling, and that would otherwise not be accessible.

3.3 PIPE GUARDS

Pipe guards shall be set vertically in concrete piers. Piers shall be constructed of, and the hollow cores of the pipe filled with, concrete specified in SECTION 03300 CONCRETE FOR BUILDING CONSTRUCTION.

3.4 ATTACHMENT OF HANDRAILS

Toeboards and brackets shall be installed where indicated. Splices, where required, shall be made at expansion joints. Removable sections shall be installed as indicated.

3.4.1 Installation of Steel Handrails

Installation shall be by base plates bolted to stringers or structural steel framework. Rail ends shall be secured by steel pipe flanges anchored by expansion shields and bolts.

3.5 PARTITION POSTS AND OPENINGS

Posts shall be set in shoes bolted to the floor and in caps tap-screwed to clip angles in overhead construction, as indicated. Openings shall be formed using channels similar to the partition frames at ducts, pipes, and other obstructions.

3.6 INSTALLATION OF SAFETY NOSINGS

Nosing shall be completely embedded in concrete before the initial set of the concrete occurs and shall finish flush with the top of the concrete surface.

3.7 INSTALLATION OF ROOF SCUTTLE

Installation shall be in accordance with manufacturer's instructions. Manufacturer shall guarantee against defects in material or workmanship for a period of five years.

3.8 INSTALLATION OF BAR-GRILLE LOUVER GUARDS

Bar-grille window guards shall be securely anchored to cold formed structural steel framing with 1/2 inch diameter prison-type screws or bolts, or other type of fastenings if the ends of such fastenings are welded to the adjoining metal grilles or otherwise made tamperproof in a satisfactory manner. Spanner-head screws or bolts are not considered prison-type fasteners.

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